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## Final Report

*Project Title:*

# Hazardous Material Transportation and the Security Externality: What Should be Done?

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The New England University Transportation Center is a consortium of 8 universities funded by the U.S. Department of Transportation, University Transportation Centers Program. Members of the consortium are MIT, the University of Connecticut, University of Maine, University of Massachusetts, University of New Hampshire, University of Rhode Island, University of Vermont and Harvard University. MIT is the lead university.

This project examined the “safety and security externalities” which exists in the transportation of hazardous materials (particularly Toxic Inhalant Hazards) and identified alternative mitigation strategies. The combination of terrorist attacks, natural disasters, and human error has brought increased attention to the vulnerability of our infrastructure and population resulting from the transportation of hazardous materials, especially through cities. The primary objectives of this study were to identify risks associated with transporting toxic inhalant hazards (TIH) and propose approaches to mitigate the negative safety and security externalities created by hazardous materials transportation.

In order to achieve these objectives, we completed the following:

1. Characterized the safety and security externalities: What are the dimensions of the safety and security externalities, what impacts do they generate, how large and likely are they and who bears the risk?
2. Identified potential mitigation models: What alternative transportation or supply chain models offer the best means to reduce risk and internalize the externality?
3. Offered policy recommendations: What actions should policy makers and private providers take to support the overall economy, ensure the financial viability of transportation carriers, and protect the public against both accident and terrorism?

The research identified several risk reduction strategies that could be implemented. First, is to continue improving safe operations, reducing human error and mechanical failure. The implementation of positive train control, selective speed restrictions for dangerous cargoes, and better coordination with first responders can reduce accident risk. Second is enhancing security through strategic re-routing to avoid major population centers and other attractive terrorist targets. Longer-term, there are opportunities for product substitution and co-location that will reduce the volume of TIH shipments and, importantly, confront the challenges of both safety *and* security.

The risk reduction strategies were used to inform a series of policy recommendations. The guiding principles developed for policy actions included the following:

- Policy solutions should recognize the risk of TIH carriage as an externality, and should aim to incorporate external costs into the cost of TIH products.
- There is no single solution; instead, a menu of policies aimed at reducing risk and consequences should be adopted.
- Unintended consequences should be part of the assessment of policies that avoid steps that may mitigate one risk at the expense of the other.
- Solutions should allow markets to allocate accountability equitably, effectively, and with incentives for all of the parties to invest in mitigation strategies.
- The interests, of all of the stakeholders and all elements of the supply chain in the management and financing of externalities associated with TIH production, transport, and use must be taken into account when safety and security policies are made.
- Regulatory authority should be as clear and concentrated as much as possible to simplify policy creation and enforcement.

Taking these principles into account, Congress and federal regulators should create incentives, funding, and mandates to address the TIH challenge in three ways: internalizing external costs and creating a fund for claims, enhancing emergency response, and focusing regulatory authority. Internalizing costs and creating a fund for claims are critical. Supply-chain participants should estimate the total cost of exposure to risk and internalize it into the price of TIH products. A first approximation of the cost of risk already exists in private insurance prices. . The cost of such insurance is high, because of the limited pooling opportunity for such risks and the potential for substantial damage payouts.

A step towards reflecting these costs would be to incorporate insurance costs for the entire supply chain into the freight rates. Internalizing the external cost of TIH risk via this insurance model would be a market-based but indirect approach. Incorporation of the risk of TIH release into transportation costs might appropriately be accompanied by creation of a liability fund to pay claims in the event costs of a release exceeded insurance coverage. Otherwise, a large accident, or multiple accidents, might bankrupt one or more supply chain participants. Following the Oil Spill Liability Trust Fund (OSLTF) model, a federally-sponsored TIH liability fund could create a pool of money for damage from releases beyond insurance coverage.

None of these policy options are, however, sufficient to compensate for the potential worst-case consequences of a terrorist attack on a shipment of TIH through a highly populated area. For such a situation, the government's terrorism re-insurance system, outlined under the Terrorism Risk Insurance Act (TRIA), is available. TRIA might also be extended to cover particularly damaging accidents, as well, since the consequences of accidents occurring at midday in a city might approach those of a terror attack. This might mitigate some of the financial pressure on of internalizing the risk of TIH accidents into product and shipping costs.

These suggestions, targeted at internalizing TIH externality and creating a fund for TIH release-related damages, should yield three positive outcomes. First, and most significant, is reducing the volume of TIH materials used and transported through encouragement of product substitution and co-location. Second, these options would enable compensation for TIH- related damage without bankrupting producers, transporters, or users. The third benefit is a transition plan that would balance equity and speed.

The full working paper is available at:

[http://belfercenter.ksg.harvard.edu/publication/19929/rail\\_transportation\\_of\\_toxic\\_inhalation\\_hazards.html?breadcrumb=%2Fexperts%2F2172%2Fmark\\_fagan](http://belfercenter.ksg.harvard.edu/publication/19929/rail_transportation_of_toxic_inhalation_hazards.html?breadcrumb=%2Fexperts%2F2172%2Fmark_fagan)

Two journal publications resulted from this project:

Between Safety and Security: The Policy Challenges of Transporting Toxic Inhalation Hazards, Branscomb, Ellis and Fagan, *Journal of Homeland Security and Emergency Management*, 2012.

Transportation of Toxic Inhalant Hazards: Addressing the Double Dichotomy, Mark Fagan, *Journal of Transportation Law, Logistics and Policy*, Vol 79, Number 1, 2012.

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